REGULATION OF TASTE-ACTIVE COMPONENTS OF MEAT BY DIETARY PROTEIN LEVELS

Fujimura, S., Eguchi A., Kobayashi, T., Sakai, F. and Kadowaki, M
Faculty of Agriculture, Niigata University, Niigata, 950-2181 Japan

Background

Dietary nutrients play a significant part in determining growth rate and meat yield. It is known that the compositions of protein and total amino acids of meat are constant with respect to feeding treatment, hence the meat taste is considered to be constant in that regard as well. However, the relationship of taste components of meat with nutrients is not fully elucidated, and there have been few reports on the effect of feeding treatments on taste-active components of chicken meat. Previously, restricted feeding and dietary low metabolizable energy levels decreased the free Glu content of meat, and the meat taste was deteriorated. Therefore, meat taste can be affected by diets. In this study, the increase in free Glu and sensory score of meat by the diet was studied.

Objectives

In this study, the relationship of dietary crude protein (CP) levels with taste components in chicken meat extract was studied, focusing in particular on the taste-active components. Three experiments were conducted, Experiment 1: meat type chickens were fed graded CP level diets for 10 days, and the meat composition, free amino acids and ATP metabolites were measured. Experiment 2: meat taste was evaluated by a sensory panel. Experiment 3: taste components and Glu-related enzymes of meat were measured at 0, 3, 5 and 10 days.

Materials and methods

Experiment 1: The 14-day-old female Cobb strain broiler chickens were divided into four groups of twelve chicks. The chicks were fed CP 17.6, 26.4, 30.8 and 35.2% diet. All the chickens were kept in individual wire cages. Free amino acids and ATP metabolites of the pectoral meat extract were measured. Experiment 2: Two sensory evaluations, paired comparison test and Scheffe's paired difference test, were conducted between meats of the CP17.5% and 30.8% groups. Experiment 3: The 14-day-old broiler chicks were fed CP 30.8% diet for 10 days. At day 0, 3, 5 and 10, free Glu and Glu-relate enzymes in muscle were measured. For the investigation of Glu regulation mechanism, glutamate dehydrogenase (GDH), kidney type glutaminase (KGA), glutamine synthetase (GS) and alanine transaminase (ALT) activities were measured by enzymatic methods (Bergmeyer, 1974).

Results and discussion

In Experiment 1, free Glu of meat significantly increased in the high CP diet, while 5'-inosinic acid (IMP) was constant. Because free Glu content of meat were above the taste threshold value of Glu, these variations were considered to have affected the taste. In the sensory evaluation (Experiment 2), the taste of the meat of high CP diet group was found superior ($P<0.01$) to that of the control group, especially in overall preference, thickness and umami taste. These results suggested that, dietary CP levels could affect taste-active components, especially free Glu. In experiment 3, after 3 and 5 days on high CP diet, free Glu of muscle was higher than that of 0 day, and tended to decrease after 10 days. KGA activity, with respect to the CP 30.7% diet, was lower than that of the control ($P<0.05$). There were no differences in GDH, GS and ALT activities. KGA was considered to contribute to the free Glu increase. Feedback inhibition of GA activity by high Glu concentration at day 5 may have affected the free Glu concentration of muscle at day 10.

Conclusions

Free Glu and sensory scores of chicken meat increased by dietary CP levels. Because the variation of the taste component improved the taste of meat, the feeding regime may be one of the important factors affecting

the taste of chicken meat. We thus conclude that short-time feeding of high CP diet, especially for 3 to 5 days, may well be an appropriate measure to improve the taste of meat.

References

Bergmeyer HU. 1974. Methods of Enzymatic Analysis. 2nd ed. Academic Press. New York.
Fujimura S, Kawano S, Koga H, Takeda H, Kadowaki M, Ishibashi T. Identification of taste-active components in the chicken meat extract by omission test - Involvement of glutamic acid, IMP and potassium ion. Anim. Sci. Technol. (Jpn.), 66: 43-51. 1995.
Fujimura S, Koga H, Takeda H, Tone N, Kadowaki M, Ishibashi T. Role of taste-active components, glutamic acid, 5'-inosinic acid and potassium ion in taste of chicken meat extract. Anim. Sci. Technol. (Jpn.), 67: 423 -429. 1996.
Fujimura S, Kadowaki M, 1999. Effect of restricted feeding on taste-active components, free glutamic acid and 5'-IMP, of chicken meat. 45th Int. Cong. Meat Sci. Technol., 2: 430-431.
Fujimura S, Sakai F, Kadowaki M, 2001. Effect of restricted feeding before marketing on taste active components of broiler chickens. Anim. Sci. J., 72(3): 223-229.

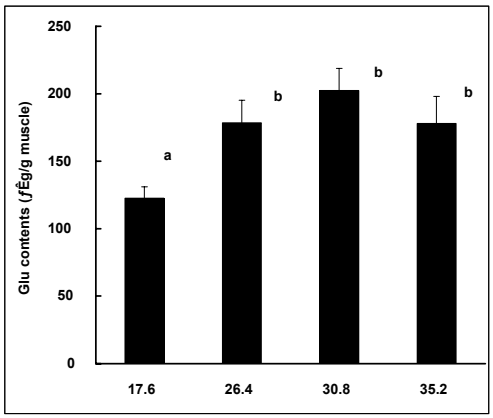

Figure 1. Effect of dietary CP levels on free Glu contents of pectoral meat extract. Values expressed as means+SE, n=6 chicks per each group. (P<0.01)

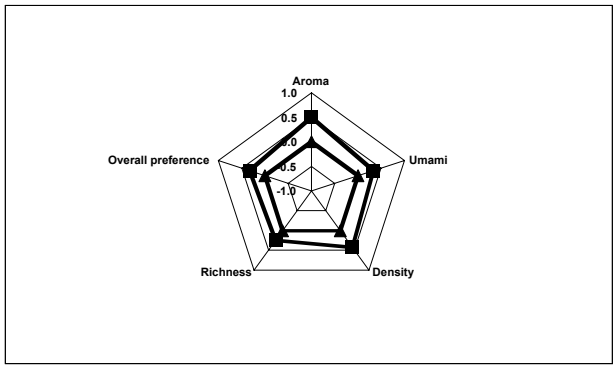

Figure 2. Scheffe's paired difference test between pectoral meat extracts with respect to the CP 17.6 and 30.8% diets.